discussions, with careful prearrangement, having for their special object to elucidate the present state of knowledge on some particular subject, to define its unsolved problems, and suggest or indicate the most fruitful lines for future research and discovery? To such discussions eminent workers in the subject, even though not fellows, should be invited. The object should be to direct individual workers to lines of investigation converging in certain useful directions.

The example would then doubtless be followed by other societies; indeed, the Faraday Society has held several successful meetings of this kind. The function of such meetings should be to stimulate the thoughts and originality of the adult investigators, just as the teaching of a good teacher does for his students. Then, in the next place, valuable work might be done by the formation in these societies of committees of investigation, composed of small groups of members or fellows charged with the special duty of following out some particular line of experimental or theoretical work, and publishing the result as the joint work of the committee, and not of individual members of it. Such committees have often been formed and done much valuable work, and it suffices to mention the British Association Committee on Electrical Units to recall one of the most famous of them, and the Engineering Standards Committees of the Institution of Civil Engineers.

At the present time, members of learned societies either sit and listen to abstracts of papers read by others or read one of their own, but they seldom, if ever, find the opportunity of joining hands in a piece of joint work to which all would contribute an effective share. There are many fields of investigation in which the work of the mathematician, the physicist, the chemist, and perhaps the engineer could be united with great advantage, and far more valuable work done if each member of the partnership were to play for the team than simply for his own hand.

The mathematician is apt to direct his attention too much to problems in which the technique of his science is involved, and too little to the function of co-operating with experimental research in bringing us to fresh discovery. In like manner, the experimentalist may have his skill more rewarded if directed by the guidance of the mathematician, who can point out to him the best direction in which it can be utilised.

No doubt such co-operative work requires an amount of self-suppression which is not widely distributed, but it is what every public-school boy exhibits who plays cricket or football for his house and not for himself, or every soldier or sailor who puts "The Service" before everything concerning his own life and interests. Then the same thing applies to commercial research. Every British manufacturer who affords himself some small degree of scientific research in his business is anxious, before all things, to keep his difficulties and knowledge to himself. If he could be induced to see that his real foes are, not his own kindred, but the highly organised German manufacturers, perhaps he might be inclined to listen to suggestions for co-operative research maintained by common effort in the common interest. There are in all manufactures scientific problems which all concerned are interested in solving. These could probably be better dealt with by a strong and highly competent scientific staff maintained in common than by insufficient individual effort.

In this matter, however, we work in a vicious circle. Until the manufacturers recognise that sufficient inducement must be offered to the highest scientific ability to enter commercial service, the best men will not take up the work, and until such highly trained men with initiative are proved to be available, the manufacturers are sceptical as to the advantages of scientific assistance. Nevertheless, the supply will create the demand, and it is the duty of the universities and technical colleges to see that the training they provide turns out first-class, and not only second-class, men.

The Advisory Council concerned with the Organisation and Development of Scientific and Industrial Research should have all these matters in review. We stand at the entrance to a new era in the life of the world, and it is imperative that we should all look the facts fairly in the face, and realise that we have to attain in every department of national life a higher efficiency and more effective service for the common good.

SCIENCE AND ART OF ILLUSTRATION.

The Essentials of Illustration: a Practical Guide to the Reproduction of Drawings and Photographs for the Use of Scientists and Others. By T. G. Hill. Pp. xii+91. (London: W. Wesley and Son, 1915.) Price 10*s.* net.

IF too little importance has been hitherto attached by the writers of scientific books to the way in which they have been illustrated, it is due to various causes, not the least of which is the want of guidance as to the manner in which pictorial illustrations are produced. Want of skill in draughtsmanship, and want of artistic perception in the selection or arrangement of subjects, no doubt account for some of the shortcomings of illustrated scientific works. But beyond these causes there exists a third, unfamiliarity with the technical processes employed in the manufacture and printing of illustrations of different kinds. Drawings made with the pencil, the pen, or the brush require each of them a different treatment from that which is appropriate for photographs. The arts of copper-plate etching, of dry-point etching, of mezzotint, of wood-engraving, steel-engraving, lithography, and aquatint are each marked out for special preferences in particular cases. In the case of photographic reproduction the processes of photogravure, collotype, half-tone block making and line block making have each their own particular advantages; some are better for one subject, or for one kind of book, and others for other subjects or books. And this quite apart from any of the more complicated questions of reproduction in colour.

The volume before us is a brave and not unsuccessful attempt to guide the scientific writer, and to put into his hands a manual which in clear and simple language reviews the various means by which book illustrations are made, whether by hand or by camera, and converted into printed pictures. The author, who is a professed botanist and an accomplished artist to boot, possesses a wide acquaintance with the art of book illustration, and his references to leading works in which the pictures are produced in different ways are copious and appropriate. He is as much at home with the delightful wood-cuts of the old herbals of Fuchsius and Matthiolus as with the hand-coloured copper-plate engravings of Sowerby or the plates in the *Philosophical Transactions*. But for scientific workers other than botanists it will be tantalising to find that for examples of different kinds of illustration a majority of the references are to the volumes of botanical serials or to inaccessible and obscure botanical monographs. The abundance of excellent illustrations, nearly all original, including twelve plates and thirty-eight text-figures, goes far to atone for this defect.

Our author discusses his subject under the three headings of intaglio printing, plane surface printing, and relief printing. He deals with the first section in eleven pages, in which brief compass he includes technical descriptions of the processes of line engraving, etching, soft-ground etching, mezzotint, and photogravure. The instructions are too brief to be taken as working guides for the practice of the respective arts, but may serve to enable intelligent readers to recognise the process by which any particular illustration has been produced. Under the title of "Plane Surface Printing," a large amount of space is rightly devoted to lithography, though for the successful employment of this process a degree of craftsmanship is necessary to which few scientific book-writers can ever attain. Chromolithography is dismissed very briefly, as are photolithographic processes also; while more attention is given to collotype, a process which except in the hands of professional craftsmen is seldom satisfactory. Under the heading of "Relief Printing" are grouped the topics of wood-cutting and wood-engraving (of which arts the author wisely omits all technical instructions), the half-tone photo-mechanical process, the half-tone three-colour process, the production of photomechanical line-blocks, and the swelled-gelatine process. The survey is not quite comprehensive; it does not include the useful, if little used, process called "monotype" or "electrotint," which is one of the easiest for amateurs. It does not mention the excellent tungstate of lead process for line-blocks used by Messrs. Walker and Boutall. Neither does the author refer to the use of a process, common in the production of postage-stamps, of surface-printing transferred from an original that was engraved on copper or steel.

Probably the most useful parts of the work will be the passages intercalated between the descriptive matter, in which the author gives admirable advice to the writers of scientific papers on the preparation of their illustrations, on methods of drawing for reproduction, whether of line-diagrams, or of microscopic details, of maps, or of graphs. He advises, on the whole, against the use of separate plates, and is in favour of illustrations incorporated in the text, and therefore printed from relief-blocks. Some of the suggestions about spacing out figures on a plate or avoiding the abomination of glazed paper, are, if rather naïve, decidedly apposite. By way of affording comparison between results of rival methods three plates are given, produced from the same photographic negative (a salt-marsh in Brittany) in photogravure, in collotype, and by half-tone block respectively. All are excellent; but the half-tone block is remarkably good.

The recommendations as to drawing for the purpose of reproduction are excellent, but the author should not call the art of "lettering" (so neglected by non-professional draughtsmen) by the name of "printing"; that is exactly what it is not. Very useful hints are given as to the aid to be derived by drawing in waterproof ink upon an ordinary photographic silver-print, which is then bleached out chemically (recipes given for the bleaching agent), leaving a useful line-drawing.

Very useful, too, are the remarks as to the stages, in the various processes, at which corrections may be made. We miss certain references which might be expected. There is no mention of the etched copper-plates of Hooke's "Micrographia" (1665), with its celebrated enlargement of *Pulex irritans*; or of the use of copper-plate etchings printed in the text as in many early books in science; or any reference to the great advantage (if properly printed) of wood-engraved line diagrams with lines and letterings cut in white against a black background, as in the "Œuvres de Verdet," admirably printed about 1870 at the Imprimerie Nationale of France. But the success of these last-named cuts depends essentially upon the quality of the ink used, a weak point with almost every English printing house, as William Morris discovered when he wished to produce the Kelmscott books. For some unknown reason English printers prefer a "grey" to a really fine black printing; and the ink they habitually use would be quite unsuitable for some of the finely-cut blocks which adorn certain recent German text-books of physics. The final chapter on relative cost of blocks and plates is, in spite of some defective arithmetic, commendable.

On page 67 the author makes the comment that drawings of microscopic details, usually produced by lithography, ought not to be so, "since the figures are necessarily divorced from the letter-press." This is an entire blunder. One of the most satisfactory of modern text-books, the "Practical Pathology" of Prof. G. Sims Woodhead, has more than a hundred exquisite illustrations, in two or three colours, printed in the text. The printing of this and other kindred books seems to be an enviable speciality of a firm of Edinburgh printers.

A final word of praise must be given to the manner in which this book is itself produced. The typography is far above the average; and in respect of clear type, wide margins, and clean imposition is a credit to the press from which it issues. The omission of an index is an unpardonable sin, for which the printer is not responsible.

S. P. T.

ABORIGINAL INHABITANTS OF NEWFOUNDLAND.

The Beothucks or Red Indians, the Aboriginal Inhabitants of Newfoundland. By J. P. Howley. Pp. xx+348. (Cambridge: At the University Press, 1915.) *1l. 1s.* net.

THE Beothucks described in this fine monograph, the result of the life-long devotion of Mr. Howley to the investigation of this mysterious tribe, are an ethnological puzzle, and, like that of the Tasmanians, with the scanty material at our disposal it is practically insoluble. In the case of these two races we possess little material save some articles recovered from their graves or camps and the more or less vague and fragmentary accounts of untrained observers.

The Beothucks were relentlessly attacked on two sides: by the Micmacs, an intrusive Algonkin race from the American mainland, and by the French and British hunters and fishers who began to visit Newfoundland when its valuable fisheries became known in Europe.

As in the case of the Tasmanians, the last survivor was a woman, who died in 1829. Before their final disappearance the conscience of the colonists had been aroused to the tragedy of the destruction of a friendless and generally inoffensive people. An institution for their protection was established, and expeditions were sent in search of the survivors, but without much result. One exploring party came into touch with them in 1810, but owing to misunderstandings and some lack of intelligence on the part of the leaders, little was learned about them. We know that they lived in circular or octagonal huts with a fireplace in the centre, round which in a circle of pits the occupants sheltered themselves from the rigours of winter. They were a tall, robust people, dressed in skins, armed with bows and arrows, spears, and clubs. They did not, like the Indian tribes of the mainland, scalp their dead enemies; they cut off their heads and stuck them on poles. Of their religious beliefs we know little. They recognised a life after death, and that the spirit held some sort of communication with the survivors, and they seem to have believed in some greater spirit, like the Manitou of the Indian tribes. They are said to have washed themselves only after the death of their wives, a rite pointing to some kind of belief that the ghost clung to its nearest relative. They used red ochre freely as an ornament.

It is difficult to decide their racial affinities. Some believe them to be connected with the Red Paint people of Maine. A wilder theory represents them as the descendants of Scandinavian ancestors, but this is disposed of by their skull measurements and the scanty vocabularies which survive. They were probably not allied to their nearest neighbours, the Micmacs and the Eskimo, but they may have been a branch of the Algonkins, modified in appearance and manners in their new environment. This migration from the mainland must have been early; otherwise their language would more closely resemble that of the continental tribes.

It is easy to blame the early colonists for the